THE NATURE CONSERVANCY NEWS

January/February 1985

CENTRAL FLYWAY

Wood duckling in nest-hole /by Steve Maslowski

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THE NATURE CONSERVANCY NEWS

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COVER: Sandhill cranes in flight over the Platte River. Some 80 percent of the world's population of sandhills pause on the Platte during their spring journey to northern breeding grounds. Photo by Tom Mangelsen.

The Nature Conservancy is a national conservation organization committed to the preservation of natural diversity by protecting lands and waters supporting the best examples of all elements of our natural world.

To date the Conservancy and its members have been responsible for the preservation of 2,302,149 acres of forests, marshes, prairies, mountains, deserts, and islands: home to rare and endangered species of wildlife and plants. 3,542 projects have been completed since the acquisition of the first preserve in 1954. Approximately 60% of all preserves are retained by the Conservancy and managed by staff and volunteer land stewards.

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The Central Flyway

by Frank C. Bellrose and Robert A. Heister

IN ITS RUN between Cheyenne, Wyoming, and Omaha, Nebraska, Interstate 80 literally spans the width of the Central Flyway—one of four main "arteries" for wildfowl migrating through North America. If you look at a map, you'll find that most of this 500-mile stretch of highway parallels the Platte River, which, come March, hosts spring migrants bound for northern breeding grounds extending from the Nebraska "sandhills" (only a few miles north of the Platte) to the Siberian tundra. They have originated from wintering habitats in the Texas Panhandle, the Pecos and Rio Grande Rivers of New Mexico, the Gulf Coast of Texas, and Mexico's Central Highlands.

All of the birds have one thing in common: an internal drive to return to their breeding grounds as rapidly as their fat reserves and the weather permit. Because their energy for reproduction depends upon obtaining food during the flight north, the Platte River and all similar lands en route are vital resting and feeding sites.

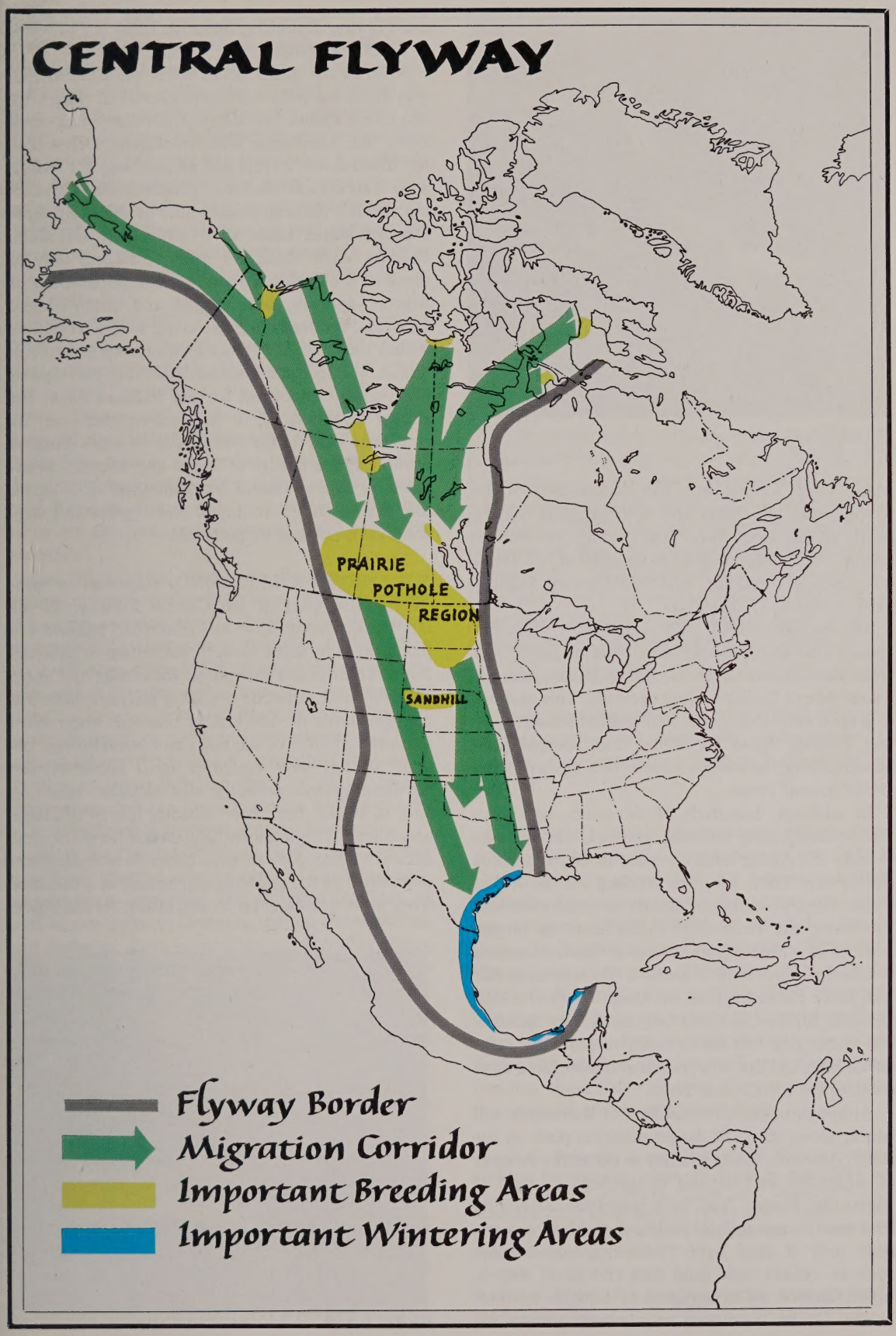
In addition to Nebraska's Platte River and the ephemeral waters of the Rainwater Basin to the river's south, the Central Flyway contains two other major components, which are neatly separated by Interstate 80. Breeding grounds of ducks, geese, and cranes lie to the north (in the "prairie pothole region" of Canada and the northern Great Plains states); principal wintering areas occur to the south (primarily in marshes along the Texas Gulf Coast).

The massive March gathering of wildfowl migrants in mid-journey at the Platte is no random phenomenon. Year after year in spring and fall, the same species travel the same routes, journeying back and forth between northern breeding areas and southern wintering areas. For waterfowl management purposes, the U.S. Fish and Wildlife Service assigned these routes to four flyways: Pacific, Central, Mississippi, and Atlantic. Each of these designated passages or regions is based on banding data showing that birds return to the same site every year.

Flyways are useful "geopolitical" units because they group together states with common borders whose waterfowl management problems are similar. But they cover too extensive an area to delineate the passage of waterfowl populations, especially the movements of birds not traveling in a straight north to south "flyway-style" direction. Migration "corridors," on the other hand, outline the routes of each population (ducks, geese, cranes, swans, etc.) and in some cases subpopulations (such as Canada geese and pintails) in a flyway. They were developed by studying band-recovery data and population distributions and by observing patterns of migrating waterfowl on radarscopes at various U.S. weather stations across the nation.

Many corridors within the Pacific, Mississippi, and Atlantic Flyways enter from other flyways and run diagonally or laterally. However, the Central Flyway is the most "legitimate" of the four in the sense that its migration corridors lie *within* its borders and most run in a north-to-south pattern. Also, unlike the other flyways, which take in a number of different landscapes, the Central Flyway embraces one in particular: a great expanse of North America's last northern grasslands. These prairies harbor some of the nation's richest wetland ecosystems—prime waterfowl habitat.

SINCE EACH WATERFOWL species begins life on its northern breeding grounds, the source of migration corridors in the Central Flyway is in the high Arctic. Some greater sandhill cranes start their flight south from eastern Siberia and cross the Bering Sea to the Seward Peninsula where their flight is augmented by other crane populations from Alaska, the Yukon, and the Northwest Territories. Populations of "small" Canada geese head south from nesting areas lying between Canada's Mackenzie River and the Queen



Joan Pennington

Phil and Judy Sublett

Canada goose and young.

Maud Gulf; others enter the eastern part of the flyway from the Baffin and Southampton Islands, north of Hudson Bay. They form two distinct groups: the "tallgrass prairie population" of about 150,000 geese and the "shortgrass prairie population" of some 125,000 geese.

Meanwhile, about 50,000 lesser snow geese migrate down along the western edge of the flyway from the Mackenzie Delta, Banks Island, and the Queen Maud Gulf breeding grounds. This number is greatly exceeded by the half-million lesser snows that migrate from the Baffin and Southampton Islands along the eastern edge of the flyway to the Gulf Coast of Texas.

In addition, hundreds of thousands of shorebirds—sandpipers, curlews, godwits, and plovers—leave the Arctic tundra to pass through much of the flyway. They, too, are heading for the Texas coast. Next to wetland habitats of California and Louisiana, the Texas Gulf Coast hosts the largest number of wintering waterfowl in North America—usually more than 2 million. Its wetlands fall into three habitat types: the deep-marsh rice belt between Sabine Lake and Galveston Bay, the shallow-marsh rice belt between Galveston and Matagorda Bay, and the tidal marsh and associated bays south to the Rio Grande Delta.

Although impressive numbers of shorebirds will winter along the Gulf, larger numbers push on for South America. Many journey as far as the pampas of Argentina and beyond to the limit of land at Tierra del Fuego. Yet, in a migration extending over many thousands of miles, shorebirds can endure only if they have "refueling stops"—sites such as Texas's tidal mud flats and shoal waters, which harbor an abundance of aquatic invertebrates. Similar conditions vary greatly in the Central Flyway, depending upon the existence of water in natural wetlands.

Most of the game ducks enter the Central Flyway from the prairie pothole district of the northern Great Plains; but many populations also come from the Athabaska and Mackenzie Deltas and the Slave River Parklands, all in Canada's Northwest Territories. Mallards predominate, numbering about 2 million, second only to the Mississippi Flyway, which leads all flyways with 4 million. Pintails reach about 1.5 million, second only to those of the Pacific Flyway. Sizable populations of wigeon, gadwall, blue-winged and green-winged teals, and redheads migrate along several corridors within the Central Flyway to wintering grounds in Texas, Mexico, and Central America. This flyway is especially important for the redhead duck, for almost three-fourths of its total numbers on the continent pass south within the flyway's borders to the Laguna Madre of Texas and Mexico. Separated by barrier islands from the Gulf of Mexico, this shallow bay's abundant shoal grass and wigeongrass is relished by redheads.

WHETHER BREEDING, stopover, or wintering sites of the Central Flyway, all the lands constituting these key waterfowl habitats are jeopardized by some form of disruption or destruction. (There is one exception: for cranes and geese on arctic and subarctic breeding grounds, little has changed since the last glacier receded. The tundra and the wetlands of the taiga and boreal forest remain as they were centuries ago.) However, the northern prairie potholes and sloughs, breeding sites of ducks, have been steadily lost to drainage and filling. The adjacent grasslands used for nest sites are being plowed ever closer to wetland borders. Most of the dabbling ducks nest at a distance from water (often as far as one mile). As duck-nest

Robert Simpson

Redhead duck.

sites become more and more restricted, the loss of nests to predators increases, which results in a diminished recruitment of young to the population.

Because lands within the Central Flyway receive a scant yearly precipitation of ten to 20 inches, natural wetlands south of the prairie pothole country are scarce and vulnerable. Grasslands have been plowed under for crops; vernal ponds have been replaced by farm ponds and reservoirs. Here, too, crop irrigation has tapped surface reservoirs as well as underground aquifers. Subsequently, these wetlands have either dried up or been degraded.

In the "sandhills" of Nebraska, water pumped from beneath the ground for center pivot (sprinkler) irrigation threatens to lower the water table, which would destroy the region's numerous wetlands. Owing to water-diversion projects, the flows of the Arkansas River in Kansas and the Platte have been so reduced at certain seasons that they bear faint resemblance to their earlier grandness. Removal of water for upstream irrigation has adversely affected downstream wildlife, especially waterfowl.

The 20,000-acre Cheyenne Bottoms—once a natural marsh accruing from local runoff collecting in a sump—was so heavily drained that its demise was certain. It was restored, however, in the 1930's by the Kansas Forestry, Fish and Game Commission, which diverted water through a ditch running from the nearby Arkansas River to the sump. But in recent years, as more and more water has been removed from the river for agricultural purposes, its flow at times falls far short of providing the amount needed for the Cheyenne wetlands—the most significant waterfowl area in Kansas.

All of the Central Flyway's Gulf Coast habitats have been affected adversely by the quest to develop petroleum, chemical, and shipping facilities, as well as rice culture. Draining, filling, channelizing, and polluting have eliminated or degraded many of the region's natural wetlands. The coast's deep marshes, seemingly caught in a vice between continued development in the greater Beaumont and Houston areas, have been particularly hard pressed.

There is an additional and seldom recognized problem. To compensate for the loss of natural feeding grounds, multitudes of wildfowl now glean waste grains from privately harvested fields. But as improvements in combines and in the sturdiness of grain stems continue, grain left after harvesting is steadily decreasing. The time is approaching when ducks, geese, and cranes will extract much less energy from this dwindling food supply than the amount they will expend searching for it. When this point is reached, only a massive infusion of crops grown specifically for wildfowl will stave off catastrophic and, ultimately, irretrievable declines in the birds that depend on waste grain for survival.

MELLON GRANT SPURS FLYWAY PROTECTION

The National Wetlands Conservation Project—a five-year effort to conserve endangered water-related ecosystems in the United States—took shape in 1983 thanks to a history-making $25-million challenge grant from the Richard King Mellon Foundation.

Among the program's primary areas of concentration are Central Flyway habitats from the Texas Gulf Coast to the northern Great Plains. Already, Mellon funding has helped to provide protection for Lone Star marshlands, Platte River staging grounds, and prairie pothole breeding sites.

By encouraging gifts of land (as well as matching gifts and bargain sales), by reselling land to government conservation agencies, and through direct fund-raising campaigns, the Conservancy hopes to use and re-use Mellon funds to save wetlands worth more than $50 million. From coast to coast —and from the Canadian border to the Gulf of Mexico—the Mellon/Conservancy partnership is good news for wetland species.

ARCHING FROM the parklands of Canada to the highlands of Central Mexico, the Central Flyway takes in some of North America's richest wetlands. Among the most threatened are those that serve as critical habitat for migrating waterfowl: the northern prairie potholes, Nebraska's Platte River and nearby Rainwater Basin, and the Texas Gulf Coast's tidal marshes. Over the eons, our migrating birds have come to depend on these areas as essential links in their annual cycle of activity. This issue of *The Nature Conservancy News* features these three Central Flyway regions and the range of efforts to protect them.

Frank C. Bellrose, a member of the Illinois Natural History Survey, has spent 46 years in waterfowl research. Author of *Ducks, Geese, and Swans of North America* (Stackpole Books, 1978) and numerous articles, Dr. Bellrose developed the concept of waterfowl migration corridors.

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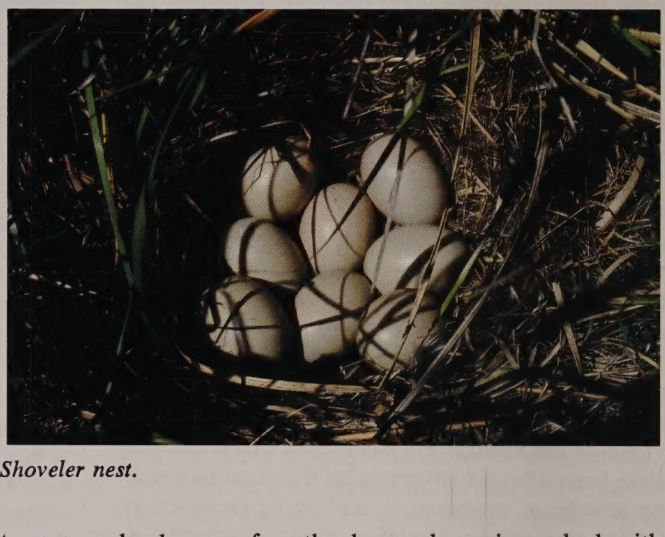
Jeff Foott

Western grebe nests in a North Dakota prairie marsh.

Nursery on the Northern Plains



Gary R. Zahm

Shoveler nest.

by Jon R. Luoma

FROM AN AIRPLANE flying due west over the North Dakota-Minnesota border, you can see the Red River, a narrow brown ribbon flowing northward towards Hudson Bay, and the Red River Valley—not a classical river valley at all, but the ancient floor of glacial Lake Agassiz. Forty miles west of the river begins a wide, flat plain of glacial drift and, after another 80 miles, a stretch of hilly upland called the Missouri Coteau.

Once, the wheat-field checkerboard here on the northern Great Plains was virgin prairie, and much of that prairie in Minnesota, Iowa, and the Dakotas was riddled with tens of thousands of small sloughs and marshes—or "prairie potholes." Today, the coteau is the finest remaining example of what this region looked like a century ago: in some square-mile sections, as many as 100 small, distinct wetlands are packed together. The rolling landscape of wetland complexes is pocked with what appear from high altitude to be hundreds, even thousands, of puddles.

The prairie pothole region has always been some of the most critical habitat for migratory birds on the Central Flyway—and, for that matter, on the North American continent. It is every bit as critical today. But each year, thousands of wetland acres are being drained in the prairie pothole states, placing this great ecological asset in jeopardy.

Overall, the prairie pothole region spans some 300,000 square miles, reaching down in a diagonal band about 300 miles wide from Alberta, Saskatchewan, and the southwestern corner of Manitoba, across the northern edge of Montana, the eastern Dakotas, western Minnesota, and into Iowa.

The region's importance to waterfowl has been

Sunlit potholes on the Conservancy's Samuel H. Ordway, Jr., Memorial Prairie, South Dakota. The preserve's 400 wetlands, ranging from large lakes to seasonal ponds, provide refuge and breeding grounds for thousands of waterfowl.

widely reported. It constitutes only about 10 percent of the wetland acreage in the United States and Canada yet produces *half* of North America's game ducks in an average year—and, in some years, up to two-thirds. Prairie potholes are brood areas for 80 percent of all ducks raised on the Great Plains of North America. A lesser known fact is that the pothole country provides critical nesting or staging habitat for dozens of species of nongame migratory birds.

In pre-settlement days, there were perhaps 20 to 25 million shallow ponds and marshes here. Before the pioneer sodbusters reached the northern prairies, the U.S. share of these wetlands covered some 115,000 square miles. By the mid-1950's, more than half of the wetlands had been drained for agriculture: only 56,000 square miles of prairie potholes remained in the Dakotas and Minnesota, with a few scattered holdouts in Iowa.

Draining continues—some 15,000 acres every year in western Minnesota and another 13,000 acres in South Dakota, according to U.S. Fish and Wildlife Service estimates. Most of the Iowa wetlands are already gone. And in North Dakota, where the drift plain and the coteau contain almost half of the remaining prairie pothole wetlands in the United States, legal and illegal drainage projects are destroying an estimated 20,000 acres of prime wetlands each year.

EXCEPT IN THE DRIEST of springs, there are thousands upon thousands of shallow, temporary ponds in unditched portions of the pothole region. Flying over the Missouri Coteau in the spring, you see what looks to be the return of an inland sea: a complex of small, ephemeral pools that offer the isolation ducks need for courtship and breeding.

After breeding, a hen typically moves into upland cover to nest—and later, after the eggs hatch, takes her brood to a larger, deeper pothole with the relative security of open water and tall edge

vegetation. Breeding ducks occur at densities of up to 88 individuals per square mile, and the pothole systems provide outstanding habitat for a wide diversity of duck species: from mallards to canvasback to pintails, gadwalls, shovelers, and teal.

Largely thanks to revenues from federal waterfowl hunting "stamp" programs, the U.S. Fish and Wildlife Service has protected more than one million acres of wetlands in the region through outright purchase or perpetual conservation easements. This is a little over half of what the agency had hoped to protect through its programs. Since 1977, a great tangle of political complications in North Dakota has brought efforts to a virtual halt, but the federal program has continued in South Dakota and western Minnesota.

The pothole region is every bit as rich a habitat for and producer of nongame migratory birds. Ted Upgren, information and education director with the North Dakota Game and Fish Department, writes that, "119 bird species of all kinds . . . either breed closely associated with [the prairie pothole] wetlands or use them for migration stopover benefits." About 40 breeding bird species that depend directly on the wetlands of the prairie pothole states range from sandhill cranes to pelicans to grebes to black terns to sandpipers and avocets and other shorebirds.

One notable example is the piping plover, a shorebird whose range is limited to three areas: the Atlantic Coast, the Great Lakes region, and the saline wetlands and riverine islands of the Great Plains. Among these areas, says The Nature Conservancy's Phil Hoose, "saline wetlands in the prairie pothole region are by far the best habitat." Piping plovers nest on sandy beaches and other sparsely vegetated shorelines, the nests themselves merely depressions in the beach.

Along much of the Atlantic Coast and on the Great Lakes, the plover's nesting season coincides, unluckily, with the summer beach season for humans and the dogs they often bring along. The bird already has been extirpated throughout much of its former range—including the southern Great Lakes states of Ohio, Indiana, and Illinois—and has been essentially eliminated from the southern half of Michigan. Very small populations survive farther north in the Great Lakes region, although the bird is listed as endangered in both Wisconsin and Minnesota. On the Atlantic Coast, recent censuses estimate that about 900 piping plovers may remain. However, the birds have vanished from at least the northern margins of that portion of the range; and on Long Island, the population has apparently declined by about 80 percent over the past four decades.

Prairie habitats are the piping plover's stronghold—especially in the Missouri Coteau, where the birds nest on sandy, salt-encrusted shorelines of alkali wetlands. These areas, which represent

Gary R. Zahm

Mallards, widgeons, and pintails fill a small prairie pothole.

Gary R. Zahm

Jim Brandenburg

Jan Eldridge

Sandy, salt-encrusted shores of alkali wetlands (top) are ideal nesting habitat for the increasingly uncommon piping plover (left). Such aquatic types, relatively rare, are important habitat for other bird species as well—including killdeer (above).

less than one percent of the region's wetland base, are typically at the low terminus of their watersheds and tend to become sinks for the alkaline salts dissolved in the system's waters. These relatively rare aquatic types and their salt flats also offer important habitat for American avocets, killdeer, spotted sandpipers, Wilson's phalaropes, willets, and marbled godwits—as well as waterfowl, gulls, and terns.

Beyond the breeding species, there are others that use the vast complex of prairie pothole wetlands as vital stopover areas during spring and fall

migration, including tens of thousands of snow and Canada geese, as well as shorebirds that breed in the far north: Hudsonian godwits, golden plovers, greater and lesser yellowlegs, black-bellied plovers, and several species of sandpipers (white-rumped, least, western, Baird's, and semipalmated).

Rare wetland flora is another ecological attribute of the northern Great Plains, but the continuing rate of drainage is destroying plant communities unique to the prairie marshes. Typical pothole plant communities might include cattail and whitetop, wire grass, arrowhead (also called "duck potato"), sago, pondweed, bur reed, and duckweed. And at the same time, sodbusting around the potholes is destroying remaining bits of upland prairie vegetation.

THE NATURE CONSERVANCY'S ability to aid preservation efforts in the region has been enhanced by the availability of funds from the Richard King Mellon Foundation. According to Geoffrey Barnard, director of the Conservancy's Minnesota Chapter, about $2 million of the $25-million Mellon grant for the Conservancy's National Wetlands Conservation Project will be used over a period of five years to purchase prairie wetland habitat. Because the grant was given to provide interim financing for key wetland projects until permanent financing is secured, the Conservancy intends to raise $5 million for acquisition here, investing and reinvesting the grant monies in targeted lands before recovering them for use as permanent rolling capital. Already, in the first year of the five-year program, the Conservancy has optioned or acquired more than 4,000 acres of prairie pothole habitat, committing $1.2 million and raising some $630,000 in cash and pledges.

Given the financial leverage the Mellon grant provides, the organization is attempting to provide a sort of ecological leverage in the region. "We're trying to dovetail wetlands and ecological diversity," says Barnard. "We're looking for areas that are themselves good wildlife habitat, but also of additional ecological value. One of the first messages we got from biologists was that upland was needed. So we might pick up an 80-acre prairie adjacent to a marsh that's already under wildlife management ownership. That way, what we've done is to make the marsh more productive by improving the wetland system."

As an example, the Conservancy identified a wetland system called Anderson Lake, in Minnesota, for a project that will involve both restoration and acquisition. The recent purchase of 387 acres (much of which was previously drained for agriculture without much success—the land is too wet for crops, too dry for wildlife), and additional planned purchases will allow restoration of a 240-acre permanent marsh with an average depth of about two feet, as well as a nearby 13-acre marsh and several hundred acres of wild upland adjacent to the marsh. The area is now used heavily by migrating waterfowl during the spring, with counts of 25,000 to 30,000 ducks and geese. Restoration will make it valuable year-round wildlife habitat and a superlative fall migration resource. One of the added benefits is the marsh's proximity to other wetlands: within a five-mile radius are 16 state wildlife management areas totaling 2,040 acres and containing more than 40 wetlands.

Similar projects are in the works elsewhere in Minnesota and in South Dakota. However, the North Dakota situation is much more complex. Since the late 1970's, land acquisition—by any entity, whether state, federal, or private—for conservation purposes has been brought to a functional halt. There are two primary factors involved. First of all, the federal wetlands fee-acquisition and easement programs have been held in abeyance while the courts determined whether a series of 1977 and 1978 North Dakota legislative and gubernatorial actions blocking such programs would stand. This series of roadblocks was closely tied to the controversial Garrison Diversion Unit, a massive irrigation project that has been opposed by such conservation groups as the National Audubon Society. In May of 1983, the Supreme Court ruled the U. S. Fish and Wildlife Service might proceed with its programs without state approval; but by the end of 1984, the agency had not yet resumed acquisition in the region.

Secondly, private acquisition (even by entities like The Nature Conservancy) has been held up by a state law that prevents corporate ownership of agricultural land—an act intended, primarily, to save family farms. But measures to allow the Conservancy to acquire natural areas are before the North Dakota legislature in its 1985 session.

NATIONALLY and internationally, there seems to be a slowly growing awareness of the value of the pothole region as a natural treasure. The question remaining: is there time left to preserve the best remnants of the prairie pothole country, before it quite literally goes down the drain?

Jon R. Luoma has written on environmental topics for a number of magazines and is a regular contributor to *Audubon*. A resident of Minneapolis, he is currently writing a book on zoos and endangered wildlife to be published by Viking-Penguin.

Gary R. Zahm

Sandhill cranes on foggy roost.

Partners on the Platte

by Jon Farrar

WINTER STILL HOLDS the Platte River in its grip when they begin arriving. Late-season snowstorms that formed over the southern Rockies move out across the plains. Arctic winds drive the snow in horizontal sheets and lash the twisting gray band of cottonwoods that trace the river's course.

Each day they grow in numbers—gray apparitions stringing in from already greened lands of Texas, New Mexico, and northern Mexico—drawn to the bleak, white landscape of a Nebraska March. By late in the month, half a million sandhill cranes, possibly more, will have paused on the Platte during their journey to nesting grounds on the tundras of Canada, Alaska, and the Soviet Union. Nowhere else on Earth is there such a gathering of sandhill cranes—some 80 percent of the world's population.

There are around 250,000 white-fronted geese, most of the midcontinent population, which began arriving even before the sandhill cranes. Mallards loaf on the sandbars, winging to feed in corn stubble that was not plowed under in autumn. Common mergansers ride low in the river's current. They seem to be washing downstream, as if their migration were not south to north but east from Wyoming to Iowa. Overhead, pintails perform their precision courtship flights. Elegant in form and plumage, a half-dozen males or more vie for the favor of a single brown hen. Many of the bald eagles that commonly winter along the Platte remain, gleaning the weak and unwary from the swelling ranks of migrating waterfowl.

By early April, the last of the sandhill cranes wheel high overhead on thermals rising from the warming earth. Their month of feeding in the Platte Valley has rebuilt fat reserves for the arduous passage to breeding sites and for lean days spent nesting on a still-thawing tundra. This is the time when conservationists hope that a few of the

world's remaining whooping cranes might return to their ancestral "layover" grounds on the Platte. During the early weeks of April, the whoopers of Texas's Aransas National Wildlife Refuge will be passing through Nebraska. Then, as the river shakes off its winter truss, the valley's breeding birds arrive. Among them are increasingly rare piping plovers and the interior race of least terns.

NO ONE CAN SAY with certainty how long the cranes, waterfowl, and terns have been coming to the Platte—perhaps since glaciers retreated north and grasses reclaimed the northern Great Plains, perhaps even earlier. When white men first met the river, it was an untethered spirit, constantly changing, shifting its course. Nothing on this vast grassland could confine it: its channels spread, twisted, turned, divided, and rejoined at will. Today, the Platte is a captive, serving the very creature that little more than a century ago stood trembling beside his oxen at the river's edge.

Settlers had barely staked their claims before they set out to control and use the Platte. Early attempts at irrigation were modest and crude, merely ditches gouged with a team and a "slip scraper" into the sandy valley soils. Yet the fruit of these labors was astounding: the fertile valley yielded bountiful, reliable harvests.

Large-scale efforts to harness the Platte—to produce hydroelectric power and store irrigation water—began early in this century. In 1909, Pathfinder Reservoir was constructed on the North Platte River in Wyoming, the first of several reservoirs to be built in the early decades of this century. Not only was the Platte's water diverted to run down ruler-straight rows of cash crops, but the timing of high flows also was altered from what it had been for thousands of years.

During the early 1940's, the first and to date the only impoundment on either the North Platte or Platte Rivers in Nebraska was constructed, creating 30-mile-long Lake McConaughy. At about the same time, the Tri-County Diversion Canal on the Platte was completed, forming a chain of irrigation reservoirs south of the river. In the years following World War II, deep-well irrigation increased significantly in the Platte River Valley. It was followed by center-pivot irrigation in the 1960's, which spread water to fields not flat enough for gravity irrigation. The withdrawal of water from beneath the valley also contributed to the river's declining flows. Since that time, additional projects that would tap the Platte's water for irrigation have been and continue to be proposed, but none has received both the required authorization and funding.

Jon Farrar

The Platte between the towns of Kearney and Odessa—part of the river's 50-mile stretch that attracts two-thirds of the sandhills stopping in Nebraska.

Jan Eldridge

A sandhill's graceful landing, ballet-style.

FRANCIS PARKMAN, who chronicled the rush of travelers through the Platte Valley in the mid-1800's, noted that the river's low banks were, for the most part, "without a bush or a tree. . . ." Why? When prairie fires periodically charred vast sweeps of the Great Plains, woody plants were at a competitive disadvantage with native grasses and forbs whose growing tips are largely hidden underground. Tree seedlings were killed, while the prairie plants proliferated. But since wildfires were considered dangerous, they were subdued by the settlers. The march of riparian woodlands west from the Missouri River and east from the Rockies was inevitable. But even without prairie fires, the battle between grasses and trees in the Platte Valley would have been long if the river had been left to carve its channels at will when charged with spring runoff from mountain snows.

Historically, shearing ice flows and high spring runoffs scoured vegetation from the Platte's islands and river banks, preventing seedlings of pioneer plants like cottonwoods and willows from establishing. Today, these peak flows are greatly reduced, stored behind a string of upstream impoundments. (All told, approximately 70 percent of the Platte's annual flow now is diverted for various uses, mostly agricultural.) Permanent, timber-covered islands are common on the Platte, particularly in the stretch of river below Kingsley Dam.

For night roosts, sandhill cranes require wide, unobstructed river channels where bank vegetation is short and the sandbars are free of woody plants. They will not roost where the channel is less than 180 feet wide and prefer those 500 feet wide. Canada geese, white-fronted geese, and whooping cranes have traditionally chosen almost identical roosting sites. In addition, least terns and piping plovers select these areas for nesting.

An authority on cranes, L. H. Walkinshaw, noted in 1954 that sandhills staged principally along the 93 miles of river between the towns of Cozad and Grand Island. Twenty years later, the upper 23 miles of this portion had been largely abandoned by the cranes. Today, approximately two-thirds of the cranes stopping in Nebraska gather on only the 50-mile stretch of the Platte between Kearney and Grand Island. By the time the Platte reaches Kearney, it has been recharged by tributaries. Thus, the encroachment of trees on this section of the river has been retarded, if only temporarily.

The native grasslands, particularly wet meadows adjoining the Platte, are equally important to both sandhill and whooping cranes. While on the Platte, the sandhills' primary food source is corn gleaned in the fields. But earthworms, snails, crickets, grasshoppers, sowbugs, spiders, and beetles found in the meadows provide protein and minerals, particularly calcium, that are essential elements for successful nesting.

As the river's channels wither through the diversion of its waters, the wet meadows are being converted into fields of row crops. From the air, former channels can still be recognized meandering through orderly fields of corn and soybeans. The once mile-wide Platte is being squeezed from both sides. An estimated 72 percent of the native grassland in the Platte's Big Bend region (traditional crane habitat) has been destroyed.

AS RIVER ROOSTING SITES and adjacent grasslands decline, cranes are forced to concentrate in ever-larger numbers or to seek new areas if they can be found. Some biologists fear that further crowding, or a shift of sandhill cranes to the nearest alternative staging site, could cause a catastrophe.

South of the central Platte lies the Rainwater Basin. Like the river, it had been a traditional staging area for waterfowl. At the time of settlement, this 17-county region of rolling plains contained almost 4,000 marshes totaling nearly 100,000 acres. These wetlands formed in sink-like depressions with clay-pan bottoms that gather and hold

rainfall and runoff. By the 1980's, draining and filling of the basins to create or improve agricultural land had destroyed 90 percent of the marshlands. In many ways, the central Platte and the Rainwater Basin can be considered a single complex, since early-arriving waterfowl drawn to open water on the river often move to the basin when the marshes thaw. As the quality of habitat on the Platte continues to deteriorate, the basin has become increasingly important.

In 1975, an estimated 20,000 to 25,000 waterfowl in the Rainwater Basin died of avian cholera. Cholera "die-offs" have occurred in most years since then and appear to have become a regular element of spring migration in south-central Nebraska. In 1980, the loss was reckoned at 72,000 to 80,000 birds—the second largest fowl cholera "die-off" ever reported in the U.S. It has been suggested that if Platte River habitat continues to shrink, sandhill cranes may begin to stage in the Rainwater Basin. Already, critically endangered whooping cranes frequently "stopover" in the basin, as do some sandhill cranes. Even if there is not a major shift of sandhill cranes to the Basin, the movement of birds between the river and the overcrowded marshes introduces the threat of highly contagious avian cholera to *all* the birds using the Platte River-Rainwater Basin complex. The situation is a "biological bomb"; the diversion of the Platte's waters and the destruction of basin marshes are the burning fuse.

THE IMPORTANCE OF THIS COMPLEX as a spring staging area on the Central Flyway has been long recognized. In the spring of 1974, the U.S. Fish and Wildlife Service proposed to buy a solid block of 15,000 acres of river bottomland west of Grand Island. A storm of protest greeted the plan. Rumors of private land being condemned to establish the refuge spread like a prairie fire on a windy March afternoon. Some people suspected the proposed refuge was no more than legal leverage to prevent further reduction of flows in the Platte. (Controlling or limiting irrigation is not a popular proposition in a state whose economy is based on agriculture.) Two successive governors publicly opposed any plan that would displace farmers. The U.S. Fish and Wildlife Service came back with an alternative to acquire key parcels of land on a "willing seller" basis and to obtain easements, but it was too late to present this new proposal in an acceptable form.

Jon Farrar

However, other events would occur to accomplish much of what the agency had hoped to achieve. In 1974, the Basin Electric Power Cooperative applied for a permit to build Grayrocks Dam on the Laramie River, a tributary of the North Platte River in Wyoming. The State of Nebraska and the private, nonprofit National Wildlife Federation objected, stating that the diversion would have a negative impact on habitat critical to the nationally endangered whooping crane in the central Platte. Under the Endangered Species Act, they filed a suit that was settled out of court in 1978. Included in the 17-point agreement was the establishment of the $7.5-million Platte River Whooping Crane Critical Habitat Maintenance Trust (more commonly called the Platte River Trust). Administered by representatives of the State of Nebraska, the National Wildlife Federation, and the Basin Electric Power Cooperative, the Trust was created "to protect and maintain migratory bird habitat" in the Big Bend region of the Platte.

Then, in 1979, a 1,900-acre parcel of grassland and hay meadow on Mormon Island, southwest of Grand Island, came up for sale. The owners wanted the area preserved for wildlife. The Nature Conservancy secured an option, which it transferred to the Platte River Trust. On Christmas Eve of 1979, the Trust purchased Mormon Island for $1.6 million, and the Conservancy retained a management lease on the land. The two groups also entered into a five-year cooperative management agreement, the principal requirement of which was that the Conservancy develop a habitat management plan. This plan was completed in less than two years. While the Trust now owns and manages Mormon Island, the Conservancy holds a special conservation easement—a legally binding contract that the land shall be maintained in perpetuity as a wildlife habitat.

The Platte River Trust and The Nature Conservancy remain working partners in protecting and improving critical wildlife habitat in the central Platte Valley. Funds made available through the Conservancy's far-reaching National Wetlands Conservation Project will be used to help purchase or obtain easements on additional tracts of land. Currently, the Trust holds title to about 3,000 acres—primarily lands on Mormon and Shoemaker Islands in the portion of the Platte that has been most heavily used by cranes in recent years. It also

Tom Mangelsen

Left: white-fronted geese, bound for northern breeding grounds, stop to rest and feed along the Platte. In March, their numbers reach 250,000—most of the midcontinent population. Above: Whooping cranes wing northward over Nebraska farmland. The critically endangered birds often use the Rainwater Basin area, south of the central Platte, as a stopover.

Tom Mangelsen

Hundreds of sandhill cranes roost in the Platte as the low sun turns river and sky golden.

has 1,200 acres in easements and is negotiating for acquisitions and easements on additional acreage.

RETAINING LANDS for wildlife is not enough, however. Maintaining or restoring habitat—especially given the reduced flows of the Platte—is fundamental to the Platte River Trust's mission. It is unlikely that the river will ever again carry flows adequate to scour sandbars free of brush and trees.

Recently, an enormous four-wheel-drive machine that mows off trees only a few inches above the ground has been used to clear sandbars or islands. Trees along the banks also are being removed to reestablish the "open river" landscape cranes and waterfowl require.

Management of the adjoining meadows is equally important. A system of rotational grazing, coupled with periodic controlled burning, is used to encourage the growth of native grasses and to prevent the encroachment of woody plants. These methods also increase the meadows' abundance of invertebrates for cranes and generally improve the quality of the range. (Cranes prefer to feed in grasslands recently burned or where the vegetation is short.)

Additionally, the income generated from grazing and haying is applied towards management costs. This marriage of agriculture and wildlife management is central to the Platte River Trust's philosophy and—along with the organization's decision to pay land taxes (though not required to by law)—has done much to ease concerns of neighboring landowners.

STANDING NEAR a sandhill crane roost at sundown—the sky filled with waves of calling cranes, legs dangling, wings cupped—it is difficult to imagine that the Platte is not as great a river as it was or could be. Paradoxically, therein lies one of the major obstacles to saving the Platte River environment and all other similar areas not protected in pristine condition. Each human generation knows only the wildlife and wilderness that was left it, not what was there before. The loss during one person's lifetime is gradual, often relatively small—a blur of small changes that go unnoticed. But over several generations, what remains may be no more than a shadow of what once was. This is the story of the Platte River—one that we hope will have a happy ending, because each spring the birds return. Where else can they go and still survive?

Jon Farrar is Senior Editor of *Nebraskaland*, published by the Nebraska Game and Parks Commission. A free-lance photographer and writer, Mr. Farrar's articles and photos have appeared in *Natural History*, *Audubon*, *National Wildlife*, and in National Geographic books. America's grasslands are his specialty.

Lone Star Wetlands

by Bob Parvin

MILLIONS OF SOUTHBOUND ducks and geese owe a grateful dip of the wings to The Nature Conservancy. A determined ally of Central Flyway waterfowl in their need to find stable wintering habitat along the development-pressured Texas Gulf Coast, the Conservancy has provided much of the momentum needed to protect some 78,000 acres of prime coastal wetland and prairie in the Lone Star State. This achievement far transcends actual preserve boundaries. For every few hundred acres of Texas coastal wetland saved, the length, breadth, and overall longevity of one of the globe's most spectacular waterfowl migration routes is better secured for the future.

Each autumn, up to 7 million waterfowl, approximately two-thirds of the total Central Flyway population, funnel down to the Texas coast. Ninety percent of these species—green-winged teals, wigeons, pintails, shovelers, gadwalls, redheads, ruddy ducks and scaups, as well as both lesser snow and white-fronted geese—stay here on their wintering grounds. The remaining 10 percent will feed and rest in the wetlands before continuing their journeys farther south to Mexico and Central America.

Presiding over all of the wintering visitors are most of the few whooping cranes left in the world. Perhaps these few dozen regal birds illustrate most clearly how the Texas coastal wetlands fit into the seasonal rhythms of the Central Flyway.

The coastal zone of Texas covers about 25,000 square miles, from Gulf edge-waters to interior distances of up to 75 miles. It forms a gentle crescent with a 375-mile gulfline running between the Sabine River and the Rio Grande. When the shoreline of the zone's numerous shallow bays and lagoons, barrier islands, and tidelands is stretched out, it measures more than 1,400 miles.

Rainbelts define upper, central, and lower sectors of the Texas coastal zone. Drenched by up to 50 inches of annual rainfall, the upper coast is a 175,000-acre western extension of Louisiana's great prairie marsh. Along this soaked 50-mile seaside, Texas's largest and most classic marsh system sifts and mixes the fresh and salty waters.

The central region, where rainfall drops off to around 40 inches, extends from Galveston Bay to Corpus Christi Bay. It embraces most of the coast's "extra length" in the form of a series of highly indented shallow-water bays and inlets, their mouths protected from the Gulf of Mexico by a string of sandy barrier islands and low, thin peninsulas. Seven major rivers end their journeys here, helping to create a melange of exemplary estuarine systems.

Almost land-locked by the long, sandy sliver of Padre Island, the tranquil waters of Laguna Madre outline the lower coastal region as it tapers toward the mouth of the Rio Grande. Yearly precipitation dips to less than 28 inches—with no more than 12 inches accumulating just inshore—and no major rivers serve to reduce the high salinity of Laguna Madre. Nevertheless, the heightened water clarity and extreme shallowness of the lagoon waters support a varied underwater garden. Also, when it *does* rain, inshore areas are dotted with thousands of freshwater potholes and lakes.

The upper and middle sectors of this mixture of tidelands, open waters, fresh and brackish marshes, swamps, and cultivated prairies serve nearly four-fifths of the Central Flyway's coast-loving waterfowl. Half of the flyway's goose population (snows and white-fronts, as well as lesser and other races of Canada geese) concentrate here along with one-third of its ducks. Meanwhile, during good years, the vegetation-rich lagoons, potholes, and tidal flats of the lower coast entice up to 94 percent of the Central Flyway's diving duck population, including all but a fraction of North America's redheads.

The Texas coastal zone is highly important not only to waterfowl but to myriad other creatures as well. Besides providing habitat (permanent or temporary) for one of the most diverse gatherings of bird species in North America, the Lone Star shorelines support several species federally listed as endangered: eastern brown pelican, bald eagle, ocelot, jaguaroundi, leatherback and Atlantic ridley sea turtles. Moreover, because they trap nutrients from both land and sea, the wetlands themselves dwarf all but a few other exceptional ecosystems in biological productivity. For instance, commercially valuable shrimp are dependent on the organically rich marshes as nurseries and breeding grounds. Texas leads the nation in the production of shrimp.

FOR OVER A CENTURY, the lands of the Texas Gulf Coast have been dredged, drilled, drained, and divided. As a result, today's conservation task is an emergency campaign to save threatened and often isolated remnants of the state's precious shoreline.

All told, more than 600,000 acres of Texas wetlands have been lost since 1950, and the impact of coastal development is so pervasive that the upper and central sectors now support about one human

Bob Parvin

Morning rays over a coastal marshland.

John L. Tveten

Snow geese at their wintering grounds on the Texas coast.

John L. Tveten

Whooping crane pair with young at Aransas National Wildlife Refuge, its winter home on the Gulf coast. The species' current breeding population numbers about 125 birds.

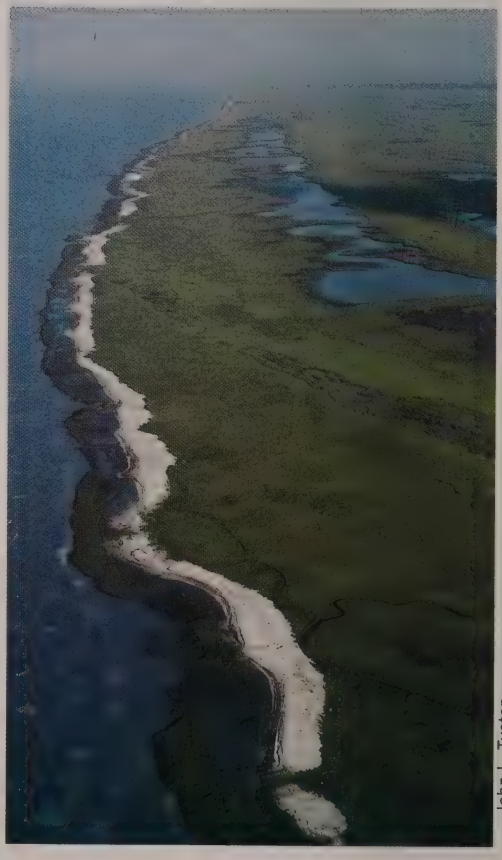
for every visiting duck and goose. Waterfowl and wildlife habitat has been drastically diminished as Texas's 12 major seaports have been linked to the rest of the world and as the state has fueled America's economy with 50 percent of its petrochemical and 25 percent of its refinery production needs. And other activities have altered these lands: impounding rivers, creating flood-control projects, dredging irrigation canals, building highways, laying pipeline networks, and raising suburbs and second-home developments above the level of hurricane tides.

In an attempt to strike a balance between future economic development needs and wetland resource protection, Texas initiated a first-time coastal zone management study in 1974. The $5-million, four-year program was spurred partly by the revelation that about 80 percent of the state's commercial fishery is sustained and nurtured by healthy estuarine systems and marshlands.

Midway through this assessment, the U.S. Fish and Wildlife Service stepped in. Service biologists teamed with state agency personnel and waterfowl experts to identify and set priorities for saving the

John L. Tveten

Gary Meszaros



John L. Tveten

Top: Setting sun backlights a mixed heron colony; above: a reddish egret performs its characteristic feeding dance with upraised wings; right: aerial view of coastline and marshes near Sabine, Texas.

best of the state's remaining high-quality waterfowl wintering and breeding habitats. The group concluded that although Texas was losing more than 1,750 acres of wetlands per year, some 286,000 acres strewn along the coast urgently needed protection as waterfowl habitat. This included about 45 percent of the state's remaining marshlands. Through the survey, 25 key areas were designated to be conserved by acquisition or by securing conservation easements. Twenty-one of these occurred in the rapidly changing upper and central coastal sectors.

SINCE 1967, The Nature Conservancy has been helping to save the Texas Gulf Coast—not only for the survival of the Central Flyway's waterfowl but for the other animals (including people) that also depend on its continued vitality. By picking up the tab on threatened wetland and coastal prairie areas for eventual resale to the U.S. Fish and Wildlife Service, the Conservancy has considerably whittled down the list of sites targeted for protection. Here are some of the success stories.

Attwater's Prairie Chicken National Wildlife Refuge: Even before state and federal wildlife agencies began concentrating on wetland preservation, the Conservancy helped set aside habitat for a coastal denizen whose population had slumped well below the critical line. Many years ago, when native tallgrasses waved across the 8 million acres of coastal prairie shared by Texas and Louisiana, the homelands of the Attwater's prairie chicken seemed abundant and secure. But the bird's territory was also choice land for grazing and for growing sorghum, rice, and cotton. Its numbers spiraled down from an estimated million birds at the turn of the century, to a rough count of 8,700 in the late 1930's, to fewer than 1,300 scattered today across ten Texas coastal counties.

In 1967, the Conservancy and the World Wildlife Fund-U.S. joined forces to acquire a 3,500-acre preserve in the upper prairie region of the central Texas coast. Resale of the property in 1972 to the Fish and Wildlife Service—which has since expanded the refuge to 5,600 acres—ensures that the Attwater's prairie chicken now has a future. The sanctuary harbors more than 125 of the rare birds.

Smith Marsh: The U.S. Fish and Wildlife Service's San Bernard National Wildlife Refuge is wedged between industrial and urban development along the lower Brazos River to the northeast and a nuclear power project to the southwest. In 1977, the Conservancy purchased 2,375-acre Smith Marsh, adjacent to the refuge, and immediately transferred it to the agency. The addition boosted the federal sanctuary to more than 17,000 acres, thereby lessening developmental threats and helping secure essential duck habitat.

John L. Tveten

The once-plentiful Attwater's prairie chicken, now endangered due to habitat destruction. Thanks to the Conservancy, the World Wildlife Fund-U.S., and the Fish and Wildlife Service, a Texas sanctuary protects more than 125 of the birds.

McFaddin Ranch: Sprawled on the upper Texas coast, McFaddin embraces 42,400 acres—three-quarters of which is wetland. It draws as many as 125,000 ducks and up to 40,000 geese. Purchased by the Conservancy in late 1978, this prize property was gladly accepted by the U.S. Fish and Wildlife Service in 1980. It lies near four other waterfowl preserves totaling more than 100,000 acres.

Sea Rim Ranch: Another area acquired for transfer to Fish and Wildlife, this 10,000-acre wetland triangle at the top of Texas's upper shoreline sector bears one of the coast's few remaining deep-water marsh systems. Today's Sea Rim National Wildlife Refuge—an 8,971-acre complex of mixed wetland and coastal prairie—is bordered by the open waters of the Gulf of Mexico and the heavily used Sabine River Ship Channel, which serves the Port Arthur-Beaumont-Orange petrochemical and refinery industries.

Barrow Ranch: Eastern neighbor of the Anahuac National Wildlife Refuge, the 12,679-acre ranch is about half marshland and half cultivated rice prairie, both prime waterfowl habitat. It also boasts more than a square mile of native prairie—a rarity in today's sliced-up coastal zone. Just 50 miles from Houston and the industrialized Port

Arthur-Beaumont-Orange triangle, and bordered to its south by the Intracoastal Waterway, Barrow Ranch was eyed as a strategic site for constructing a shipping facility. Other plans called for lacing it with drainage ditches to increase the productivity of its croplands. After purchasing the land in 1981, the Conservancy passed it on to the U.S. Fish and Wildlife Service for inclusion in the Anahuac Refuge.

Slop Bowl Marsh: A better name for this waterlogged 1,905-acre site might have been "glad tidings." It was recently acquired by the Conservancy from Sun Exploration and Production Company—the Dallas-based subsidiary of Sun Company, Inc. —along with 21 other Sun-owned tracts amounting to nearly 8,300 acres in Montana, California, and Texas. Adjacent to the Brazoria National Wildlife Refuge, the Slop Bowl marshes attract the coast's northernmost wintering populations of sandhill cranes and serve as breeding grounds for mottled ducks (whose numbers have declined drastically in Texas since 1977).

Peach Point: With six major corporations holding undivided interests in the property, the Conservancy's Texas Chapter has had its hands full in negotiating a bargain-sale purchase of the 8,500-acre wetland. The transactions were completed just as this *News* issue was going to press.

Part of the original Spanish land-grant plantation owned by Stephen F. Austin (the "Father of Texas"), Peach Point lies fewer than ten miles from the industrialized Brazosport area. It was destined to be the site of a tank farm terminal—an elaborate storage facility for imported crude oil. Pinpointed through the U.S. Fish and Wildlife Service survey as the most threatened and highest quality wetland on the Texas Gulf Coast, Peach Point encompasses brackish and freshwater marshes, coastal prairie, and several freshwater lakes. Its acquisition, like that of Slop Bowl, was made possible through the Conservancy's National Wetlands Conservation Project, funded by the Richard King Mellon Foundation.

John L. Tveten

Mottled duck nest at Slop Bowl Marsh.

WHILE THE CONSERVANCY continues its roundup of prime wetlands, the Texas Parks and Wildlife Department and the Texas General Land Office have also been active. The state now offers its own migratory waterfowl stamp in order to provide a revenue base for wetland acquisitions, and it also is seeking new sources of revenue for natural-area preservation. The General Land Office has received the authority from the Texas legislature to trade their nonecologically viable lands for wetlands—areas it will then lease to the Department of Parks and Wildlife for conservation purposes.

Matagorda Island, a 42,000-acre strip of gleaming dunes, marshlands, and tidal flats just across the bay from Aransas National Wildlife Refuge in the central coastal region, is a landmark example of the state's willingness to participate in preserving waterfowl habitat. While 23,000 acres are state-owned, the remaining 19,000 are held by the U.S. Fish and Wildlife Service and leased to the Texas Parks and Wildlife Department.

Thanks to the U.S. Fish and Wildlife Service, the State of Texas, The Nature Conservancy, and other private groups, the fragile and productive wetlands of the Texas Gulf Coast are being saved —bit by bit. But unless draining and dredging are held in check, essential habitat for waterfowl will be lost even as it is saved. The consequences for the Central Flyway's pageant of migratory birds will be felt all the way to Siberia.

Bob Parvin is a free-lance writer and photographer specializing in the environment and culture of Texas. He is intimately familiar with the Texas Gulf Coast, having spent 40 years as a sportsman, shrimper, and wanderer on the Gulf's beaches and bays.

NEW PROJECTS

ARIZONA

Muleshoe Ranch — Addition — (Cochise County). Through a 1,092-acre purchase and the lease of 2,288 adjacent acres from the State of Arizona, the Conservancy has increased protected acreage at Muleshoe Ranch to 54,660. This rugged expanse of rolling hills and deeply incised canyons at the southern end of Arizona's Galiuro Mountains embraces clear spring-fed streams, a lush riparian forest, and a semi-desert grassland community remarkably free of exotic species. Among the area's native species are *Gila intermedia* (proposed for federal listing as a threatened fish species), black, gray, and zone-tailed hawks, peregrine falcons, and bighorn sheep. A project of the Conservancy's National Critical Areas Conservation Program, the addition will help safeguard a significant portion of the Bass Canyon watershed. The entire preserve is managed by a resident preserve caretaker.

ARKANSAS

Cave Springs Cave (Benton County). Lodged in the undulating landscape of the Ozark's Springfield Plateau, this purchased 15-acre parcel bears the only entrance to Cave Springs Cave. A year-round stream flowing through the cavern supports the largest known population of the Ozark cavefish (*Amblyopsis rosae*), a blind white fish endemic to the plateau and federally listed as threatened. Its continued existence here may be directly dependent on the cave's maternal colony of gray bats, a species ranked as nationally endangered. (Bat guano supplies the stream with essential nutrients.) A protection target of the Conservancy's Katharine Ordway Endangered Species Conservation Program, the site will be transferred to the Arkansas Natural Heritage Commission for management as a state natural area.

Electric Island (Garland County). A donation from Arkansas Power and Light Company, this isle is used periodically as a rest site by wintering bald eagles. Enveloped by an oak/hickory/pine forest typical of the Ouachita Mountains of western Arkansas, the 118-acre island lies in the lower portion of Lake Hamilton, a 7,200-acre reservoir. It is now leased to the Arkansas Game and Fish Commission for use as a non-game management area.

Hell Creek Cave (Stone County). Through its Katharine Ordway Endangered Species Conservation Program, the Conservancy has acquired 163 acres boasting a cavern whose aquatic system supports the sole known population of a cave crayfish. Numbering fewer than 50 individuals, the crayfish is currently under review for federal protection. The property—which also includes the cave's natural entrance, a connecting spring, and surrounding woodlands—will be owned and managed by the Arkansas Natural Heritage Commission.

Margaret M. Lightle Wilderness Area (White County). A bequest of Mrs. Margaret M. Lightle, this 480-acre area is predominantly bottomland hardwoods lying at the confluence of Bayou Des Arc and Glade Creek. Narrow strips of bald cypress and water tupelo edge both streams. The preserve will be managed by the Conservancy's Arkansas Field Office.

CALIFORNIA

Siskiyou Mining Claim (Siskiyou County). The Conservancy purchased a ten-acre mining claim to assist the California Department of Fish and Game in preserving a critical salmon spawning habitat. Located near the Shasta River (a tributary of the Klamath River), the property will be managed by the department and the Bureau of Land Management.

FLORIDA

Everglades Conservation Area (Dade County). A 40-acre donation from the Great American Bank of Dade County (owned by Barnett Bank of South Florida) will be transferred to and managed by the South Florida Water Management District as part of Everglades Conservation Area 3-B. The tract is potential habitat for the Everglades snail kite (federally listed as endangered), Everglades mink (threatened in the state), and round-tailed muskrat (locally rare in Florida).

GEORGIA

Harris Neck National Wildlife Refuge—Addition —(Liberty County). Two parcels totaling three acres have been acquired for inclusion in the national refuge—a rookery for wading birds and habitat for the American alligator. The tracts will be transferred to the U.S. Fish and Wildlife Service.

IDAHO

Silver Creek—Addition—(Blaine County). From its sagebrush-covered hills to its willow-lined streambanks, Silver Creek Preserve encompasses an exceptionally rich spring-creek ecosystem and trout fishery. By donating a conservation easement on 80 acres, Mr. William A. McMahan has enabled the Conservancy to extend its protection here to 1,560 acres. The easement takes in about one-quarter mile of Silver Creek, as well as one-third mile of Grove Creek—a high-quality tributary of Silver Creek hosting the wood river sculpin, a fish species of special concern in Idaho. Habitat for sandhill cranes, Canada geese, northern harriers, goshawks, great blue herons, golden and bald eagles, black-crowned night herons—as well as five owl species—Silver Creek is managed by a Conservancy land steward.

INDIANA

Plaster Creek Seeps (Martin County). Indiana lays claim to only three acid seeps, a natural community type ranked as endangered in the state. Having already secured 75 acres at one of these three sites (Wening-Sherrit), the Conservancy has recently purchased land at a second: Plaster Creek Seeps, which lies at the base of steep sandstone bluffs topped by a dry upland forest. Managed by the Indiana Chapter, the 14-acre preserve supports several uncommon plant species. Two are endangered in Indiana (rock clubmoss and nutrush), and one is threatened (greenwood orchid).

IOWA

Mountain Maple Hollow. Here, on one of the richest algific talus slopes in Iowa, is a cornucopia of highly rare species. Cold air seeping from fissures in the limestone bedrock fosters the growth of glacial relict plants such as mountain maple and Canada yew. Four of the site's plant species are endangered in Iowa, one is federally listed as endangered nationwide, another is under review for federal protection. Also, according to the Iowa Natural Areas Inventory, two of the preserve's invertebrates are threatened globally; the third is endangered in the state. A project of the Conservancy's Katharine Ordway Endangered Species Conservation Program, the 10-acre purchased parcel will be managed by the Iowa Chapter.

MICHIGAN

Skegemog Lake Wildlife Area—Addition—(Kalkaska County). Purchase of a 40-acre parcel brings Conservancy-protected lands here to 2,210 acres. An expanse of swamp and marsh with a fragile bog, the preserve harbors bears, bobcats, river otters, and massasauga rattlesnakes and is a nesting site for ospreys, loons, swans, and other bird species. The addition will be conveyed to the Michigan Department of Natural Resources.

MINNESOTA

Pankratz Memorial Prairie — Addition — (Polk County). A gift of Dan and Vicky Svedarsky, this three-acre tract is an abandoned railroad right-of-way—an inholding within the Conservancy's Pankratz Memorial Prairie. White-fringed prairie orchids (endangered in Minnesota) occur on the preserve, as do greater prairie chickens and marbled godwits. An excellent example of a mesic black-soil prairie, Pankratz now totals 637 acres. The Minnesota Chapter will manage the new tract, which will be dedicated as a scientific and natural area by the Minnesota Department of Natural Resources.

MISSOURI

Mastodon State Park (Jefferson County). In concert with the State of Missouri, the Conservancy purchased eight acres for inclusion in Mastodon State Park, well-known for its excavated skeletons and bone fragments of Pleistocene-age mastodons. The park is managed by the Missouri Department of Natural Resources.

NEW JERSEY

Cape May Migratory Bird Refuge—Addition—(Cape May County). Cape May, at the southernmost tip of New Jersey, is a critical resting and feeding site for birds migrating along the Atlantic Flyway. They prepare here for the arduous 18-mile flight over Delaware Bay's open water. Raptors frequenting the area include peregrine falcon, bald eagle, Cooper's hawk, and osprey. Breeding birds are equally impressive: least terns, piping plovers, common terns, and yellow warblers. CEY, Inc. (a subsidiary of Combustion Engineering, Inc.) has donated a seven-acre tract of marsh and brackish ponds for addition to the Conservancy's 181-acre preserve, which is managed by the Pennsylvania/New Jersey Office.

NEW YORK

Albany Pine Bush (Albany County). Along with being the largest single site in upstate New York for a diverse pitch pine/scrub barrens (a threatened natural community), this area supports flora of the Atlantic coastal plain, of midwestern prairies, of Appalachian uplands, and of northern (or boreal) regions. The Pine Bush also hosts a significant population of buck moths—ranked as threatened by the Conservancy's New York Natural Heritage Program—as well as New York's greatest numbers of Karner blue butterflies, state-

listed as endangered. In cooperation with the state and the Towns of Colonie and Guilderland, the Conservancy has secured two adjacent tracts here (one is a nine-acre gift from the Muncie Construction Corporation) encompassing 42 acres. The parcels will be managed by the two townships and the State of New York.

Dwarf Pine Barrens—Additions—(Suffolk County). Nine parcels totaling nine acres have been donated to the Conservancy by Baird Real Estate Investments, Inc., Iyla Tracy Bonnecaze, Dorothy B. Davis, Col. H. Harding Isaacson (in memory of his late wife, Mary-Ann Isaacson), John L. McKenna, Vera P. Mitchell, Barbara Van Houten Mueller, Mrs. Lee D. Rice, and Harold Seelig. Managed by Suffolk County and the Long Island Chapter, the 438-acre preserve takes in part of New York's healthiest and largest contiguous dwarf pine barrens, an endangered natural community. Resident species include northern harriers and the state's greatest concentration of breeding buck moths, both considered threatened in the state by the New York Natural Heritage Program.

Fiddlers Green—Addition—(Madison County). Three natural communities more common to the Adirondacks and points north occur in this 100-acre wetland complex: calcareous fen, kettlehole bog, and northern white cedar swamp. All three, particularly the fen, are rich in unusual plant species such as southern twayblade (*Listera australis*), ranked as rare in the state by the New York Natural Heritage Program. With a 20-acre donation from Madison County, the preserve now stands at 54 acres and includes the kettlehole bog. It is managed by the Central New York Chapter and the New York Field Office.

Hands Creek (Suffolk County). Where Hands Creek spills into Three Mile Harbor, an unusual brackish tidal marsh has formed beside a salt marsh. At the base of the gravelly bluff that edges the brackish marsh on the east, fresh water seeps into this adjacent wetland, creating an unusual variation of a brackish tidal marsh. This natural community supports a mudwort (*Limosella australis*) considered rare in the state by the New York Natural Heritage Program. To be managed by the Conservancy's South Fork-Shelter Island Chapter, the two-acre purchase is the first parcel for a projected 50-acre preserve.

NORTH CAROLINA

McIntosh Bay Complex (Scotland County). Through its National Critical Areas Conservation Program, the Conservancy is saving endangered ecosystems known as Carolina "bays"—elliptical pond-like depressions of unknown origin. A recent 129-acre purchase promises protection for a complete biological system embracing three contiguous yet ecologically distinct bays: a freshwater marsh with no woody plant species; a bay supporting an herbaceous ground cover capped by a canopy of pond cypress and pond pine; and another whose plant community is usually found in peat-filled bays. Significant species include awned meadow beauty (endangered in the state), two salamanders considered rare in North Carolina, and Canby's cowbane (*Oxypolis canbyi*)—a candidate for federal listing. The complex will be managed by The North Carolina Nature Conservancy, which has now protected seven of the state's Carolina bays.

OHIO

Pickerington Pond—Addition—(Franklin County). Through a land exchange, the Conservancy has acquired a three-acre tract on the southern end of a critical wetland preserve—a haven for waterfowl. The character of this rolling terrain, whose ponds and marshes swell and recede with fluctuating water levels, closely resembles that of prairie pothole country farther west. The addition will be conveyed to the Columbus and Franklin County Metro Park District, which manages the existing preserve. Conservancy-protected land here now spans 357 acres.

SOUTH CAROLINA

Cat Island — Addition — (Georgetown County). Through its South Carolina Field Office, the Conservancy has secured a one-sixth undivided interest in 1,571 acres for inclusion in the state's adjacent 20,376-acre Tom Yawkey Wildlife Center. Primarily wetland, the addition provides habitat for wintering migratory waterfowl. It is also a feeding ground for the island's wildlife, including nesting bald eagles, and a refuge for American alligators—both federally protected species. The addition will be managed by the South Carolina Field Office.

TENNESSEE

Colditz Cove (Fentress County). A gift of Rudolph and Arnold Colditz, this 73-acre site bears a relatively undisturbed example of the cove forests that once punctuated Tennessee's Cumberland Plateau. It boasts a 65-foot waterfall, mature hemlocks and white pines, and four species considered to be "of special concern" in the state by the Tennessee Natural Heritage Program: woodland jumping mouse —and pygmy, southeastern, and smoky shrews. A designated state natural area, the cove will be

Tupper Ansel Blake

Blunt-nosed leopard lizard.

Soda Lake

Soda Lake, on the Carrizo Plain between the Caliente and Temblor Mountain Ranges, is southern California's largest natural alkaline wetland—an intermittent or "playa" lake that eons ago was a vast body of water fed by ever-flowing streams. Today, its ephemeral waters draw huge concentrations of birds migrating along the Pacific Flyway. From late November to May (when rains refill the playa's closed basin), up to 6,500 lesser sandhill cranes winter here, using the lake's shallower waters and nearby ponds for loafing and roosting. Other avian visitors include coots, pintails, shovelers, and cinnamon and green-winged teals, as well as raptors like northern harriers, red-tailed hawks, prairie falcons, and bald and golden eagles.

The lake and its narrow rim of increasingly rare alkali flats are encircled by lowland valley saltbush scrub, a plant community classified as critically threatened by the California Natural Diversity Data Base (the state's heritage program). The saltbush scrub and Central Valley grassland scrub surrounding it harbor three rare animals: San Joaquin kit fox (federally listed as endangered), blunt-nosed leopard lizard (also federally designated as endangered), and giant kangaroo rat (ranked as endangered in the state and proposed for federal listing). Nowhere else can one find such a large number of these imperiled vertebrates. Their simultaneous occurrence is by no means a coincidence: each animal interacts with or supports the other in some fashion.

A conservation management agreement between the Bureau of Land Management (BLM) and the Conservancy means that 2,960 acres of BLM land on the Carrizo Plain will be protected jointly by the two organizations. Encompassing nearly all of Soda Lake and a substantial amount of the lowland valley saltbush scrub community, the site has been proposed for federal designation as an "area of critical environmental concern" and is the core of a projected 200,000-acre mega-preserve that the Conservancy plans to create through additional management agreements, land exchanges, and acquisitions. This larger refuge will take in the Elkhorn Plain (at the southern end of the Carrizo), a current feeding area for the nearly extinct California condor. Soda Lake is a project of the Conservancy's California Wetlands Program.

transferred to the Tennessee Department of Conservation for management.

Cross Creek Eagle Nest (Steward County). A management agreement struck by the Conservancy, the Westvaco Corporation, and the Tennessee Wildlife Resources Agency ensures protection of a 270-acre mixed oak woodland with the only active and successful bald eagle nest found in Tennessee since 1961. It was used in 1983 and '84.

VERMONT

Long Pond (Orleans County). Clive S. Gray, chairman of the Conservancy's Barr Hill Stewardship Committee, has donated a 99-year management lease on 32 acres at the southern end of Long Pond—one of fewer than a dozen undeveloped lakes left in Vermont. Straddling Sawmill Brook, which drains the pond, the property's northern white cedar swamp community hosts an orchid species threatened in the state. Long Pond and the land surrounding it are habitat for moose, bobcat, fox, otter, bear, fisher, and loon. The Barr Hill Stewardship Committee will manage the new preserve.

VIRGINIA

Cressy Creek (Smyth County). Thought to be extinct for more than 60 years, the Virginia roundleaf birch (*Betula uber*) was located again in 1975 and federally listed as endangered in 1978. Out of a global population of only 23 naturally occurring trees, two are found in the Jefferson National Forest. (One of these is the population's largest individual tree.) Through its Conserve Virginia Campaign, the Conservancy has acquired a 36-acre tract adjacent to the national forest—critical bufferland, as well as an ideal site for natural regeneration of *Betula uber*. It will be managed jointly by the Conservancy and the U.S. Forest Service.

WASHINGTON

Marcellus Shrub-Steppe Preserve (Adams County). Dominated by a luxuriant mix of big sagebrush and Idaho fescue—a plant association classified as endangered in the state by the Washington Natural Heritage Program—this purchased site also hosts a threetipped sagebrush/Idaho fescue plant community, ranked as threatened in the state. The grassland's low-lying swales support imperiled vernal ponds, which dry by spring and provide habitat for salt-tolerant plants. The 266-acre preserve will be managed by the Conservancy's Washington land steward.

Pierce Island Preserve (Skamania County). Varying in size from 85 to 200 acres (depending on the water level of the Columbia River), Pierce Island harbors a plant endangered in both Washington and Oregon (persistent-sepal yellowcress) as well as a distinctive riparian community dominated by black cottonwood and willow. Offering spectacular views of the surrounding Columbia River Gorge, the island also supports a 68-nest great blue heron rookery and nesting and overwintering grounds for the Great Basin subspecies of western Canada goose. Charted for protection through the Conservancy's Katharine Ordway Endangered Species Conservation Program, the preserve will be comanaged by the Washington and Oregon Field Offices.

WEST VIRGINIA

Brush Creek (Mercer County). A rocky, tumbling stream, Brush Creek slices through this steep-sided, wooded gorge as it rushes to its union with the Bluestone River. On the craggy cliffs above the creek flourish large patches (some 40 to 100 square feet in size) of Canby's mountain lover (*Pachistima canbyi*), a plant more commonly found in small scattered clumps. This small evergreen shrub is a candidate for federal listing as endangered or threatened. Through its West Virginia Natural Areas Campaign, the Conservancy has acquired 123 acres in three tracts to safeguard *Pachistima's* habitat. The site will be managed by the West Virginia Chapter.

WISCONSIN

Baraboo Hill Project/Baxter's Hollow: The R. D. and Linda Peters Nature Preserve—Additions—(Sauk County). Well-known in the Midwest for its water purity, Otter Creek in the Baraboo Hills is a cold-water trout stream used extensively for aquatic invertebrate research. The purchase of 440 acres in three parcels extends protection to the northwest corner of the only undeveloped watershed in southern Wisconsin and to a set of springs essential to the creek's preservation. Now at 2,172 acres all told, the sanctuary is managed by the Conservancy's Wisconsin Chapter.

Summerton Bog—Addition—(Marquette County). A four-acre purchase enlarges this national natural landmark to 425 acres. A patchwork of stream-laced meadows, fens, forests, sedge meadowland, and tamarack swamps, the preserve is noted for its northern relict plant species, nine wild orchids, and migrating sandhill cranes. It is managed by the Wisconsin Chapter.

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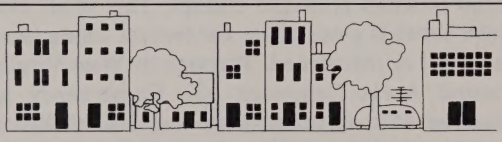

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PHOTOGRAPHY WORKSHOP

On the weekend of May 3-5, a nature photography workshop will be held at the Conservancy's Virginia Coast Reserve. For details, contact: John Hall, Virginia Coast Reserve, Brownsville, Nassawadox, VA 23413; phone (804) 442-3049.

FIELD COURSES OFFERED IN THE PACIFIC NORTHWEST

Lying at the interface between Oregon's Cascade Range and the Great Basin, the Conservancy's Katharine Ordway Sycan Marsh Preserve will be the site this June and July of beginning and advanced seven- and ten-day field courses. Studies will embrace botany, general natural history, and ornithology. Excursions will take in vast alkaline lakes, volcanic mountains, sage deserts, forests of pine and fir, and freshwater marshes hosting some 200 breeding greater sandhill cranes.

Transportation, meals, and facilities (tents) for staff and nine participants per session will be provided. Cost: seven-day/$700, ten-day/$850. For further information, contact: Sycan Education, The Nature Conservancy, 1234 N.W. 25th Avenue, Portland, Oregon 97210. Phone: (503) 228-9561.

MONTANA OFFICE OFFERS HORSEPACK TRIP

Adjacent to the Conservancy's Pine Butte Swamp Preserve in Montana is a wilderness area encompassing over one million acres—the Bob Marshall Wilderness. Known for its pristine lakes and streams, unparalleled mountain vistas, and abundant wildlife, the Bob Marshall offers visitors a true glimpse into America's Rocky Mountain wilds. The Montana Field Office invites you to join us for a horsepack trip into this rugged ecosystem from August 12-18. The trip, which will originate at the Pine Butte Preserve, is limited to 15 people. The cost is $1,500 per person (60 percent of this amount is a tax-deductible donation to the project). For details and reservations, contact: Suki Molina, Montana Field Office, P.O. Box 258, Helena, MT 59624/(406) 443-0303.

CALIFORNIA BIRDING ADVENTURE

This June 14-24, join us for the California Nature Conservancy's 1985 Birding Adventure. Two top California naturalists will lead participants from the San Joaquin Valley, over the 9,000-foot southern Sierra, to the Mojave Desert and on to the central California coast—in search of as many as 200 bird species and other wildlife. Approximate cost is $800 for Conservancy members, $825 for non-members.

For more information, write to: TNC-Birding Adventure, P.O. Box 749, Porterville, CA 93258.

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